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A preliminary checklist of butterflies from the northern Eastern Ghats with notes on new and significant species records including three new reports for peninsular India

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Abstract: The northern Eastern Ghats is an area with significant biodiversity value but remains poorly explored except for a few charismatic taxa such as birds, mammals and reptiles. Very few studies have looked at the invertebrate diversity of these hill ranges, particularly butterflies. We present the first peer-reviewed checklist of butterflies from the northern Eastern Ghats based on a rapid and intensive survey carried out at five sites over 16 days across the buffer area of Papikonda National Park and Araku Valley in 2015 and 2016. We report a total of 102 species of butterflies from six lepidopteran families. Seventeen significant records include numerous first reports: three new species reports for peninsular India, nine for Eastern Ghats and 14 for the northern Eastern Ghats. This checklist adds 17 species to the known butterfly fauna for the state of Andhra Pradesh. It is hoped that findings from the study will help to mobilise conservation research, action and attention for the northern Eastern Ghats forest habitats, which are currently threatened by large scale development, security threats due to the Naxalite insurgency and mesoscale exploitation of forest resources.

Keywords: Andhra Pradesh, Araku Valley, checklist, Lepidoptera, northern Eastern Ghats, Papikonda National Park.

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INTRODUCTION

The Eastern Ghats is a 1,750km long mountain range located along the eastern edge of the Indian peninsula. Even though studies and inventories carried out till date indicate its high diversity value, the Eastern Ghats remain one of the least explored natural landscapes of India. Its wide elevational range from almost sea level to 1,690m contains diverse vegetation types ranging from dry-scrub and dry deciduous to dry-evergreen, moist-deciduous and semi-evergreen that support diverse flora and fauna.

Unlike the Western Ghats, the Eastern Ghats is not a continuous mountain range. Instead they comprise of a series of patchy and isolated hill sections which are divided into three main zones based on their location: southern Eastern Ghats, central Eastern Ghats and northern Eastern Ghats (Rao 2000). Owing to the patchiness of the hills and variations in temperature, precipitation and elevation, each zone has its own unique floral and faunal assemblages. Variable intensities of forest-related activities such as shifting cultivation, hunting (by local communities), and plantations (usually by the state and/or policy-driven) has further led to an increase in the heterogeneity and diversity of the available land use and forest habitats (Beehler et al. 1987; Rawat 1997; Ganesh et al. 2015).

Among the three sections, the northern Eastern Ghats has the most diverse vegetation types including some of the most dense forests. Such diversity and abundance of forests is due to the relatively higher rainfall in the area, ranging from 900–1,700 mm annually, (Pattanaik et al. 2009b; Sreekar et al. 2010). The presence of perennial rivers such as the Godavari and the Mahanadi also contribute to creating conducive conditions for high forest density and diversity. In comparison, the central and the southern Eastern Ghats landscapes are drier with sparser vegetation due to lower elevation, lesser rainfall and higher annual temperatures.

Recent studies have shown that the northern Eastern Ghats region, owing to its proximity to the eastern Himalayan, the Indo-Malayan and the Western Ghats biodiversity hotspots, acts as a mixing and transition zone for these three distinct ecoregions. Therefore, elements of all these three hotspots has been observed in the northern Eastern Ghats, leading to higher diversity of plants and animals; for example, Stripe-necked Mongoose *Herpestes vitticollis*, recently discovered from the northern Eastern Ghats, was earlier recorded only from the Western Ghats (Balaji & Satyanarayana 2016). Similarly, birds such as the Ruby-cheeked Sunbird *Chalcoparia singalensis* and Pale-chinned Blue Flycatcher *Cyornis poliogenys*, earlier known as 'northeast birds' have been recorded from the northern Eastern Ghats (Prashanth 2016). Apart from sharing biological attributes with the proximate 'hotspots', the northern Eastern Ghats is home to several rare, endemic and threatened species of flora and fauna, including reptiles such as the Golden Gecko *Calodactylodes aureus* (Javed et al. 2007), Jeypore Ground Gecko *Geckoella jeyporensis* (Agarwal et al. 2012), a new species of caecilian *Gegeneophis orientalis* (Agarwal et al. 2013), birds like the Yellow-throated Bulbul *Pycnonotus xantholaemus* (Sreekar & Srinivasulu 2010) and the Critically Endangered Blewitt's Owl or Forest Owlet *Heteroglaux blewetti* (Azeez et al. 2008; Kumar et al. 2010).

Biodiversity inventories and studies carried out till date has focussed on a few taxa, such as aves (Price 1979; Ripley et al. 1986; Kumar et al. 2010), mammals (Aditya & Ganesh 2016; Balaji & Satyanarayana 2016) and reptiles (Chettri & Bhupathy 2010; Agarwal et al. 2013); however, the invertebrate taxa of the Eastern Ghats, particularly the northern Eastern Ghats, remain almost unexplored.

Among invertebrates, butterflies (order Lepidoptera, sub-order Rhopalocera) are among the most charismatic taxa. The beauty and ubiquitous nature of butterflies makes it the most effective invertebrate flagship which can be used to stimulate awareness, research and policy support for the conservation of invertebrate and overall biodiversity (Barua et al. 2012). India is very rich in butterfly taxa with over 1,300 species (Varshney & Smetacek 2015); however, they are not uniformly distributed and most of them (>1000 species) occur in the northeastern region (Varshney & Smetacek 2015). In recent times, there has been an exponential growth in biodiversity documentation in India, particularly during the last decade, owing to the rapid proliferation of digital and mobile photography. Birds and butterflies have received disproportional attention of the amateur naturalist and citizen scientists in this digital age, probably owing to their ubiquitous nature (Chandler et al. 2017). Yet, such coverage is not uniform across the geography of the country, even for well-surveyed taxa such as butterflies. Even today, there are many regions from where even basic information about species occurrences are lacking. The northern Eastern Ghats is one such region.

Apart from being ecologically rich, the northern Eastern Ghats is also one of the most threatened forested regions of the country owing to the presence of scarce and highly valuable natural resources such as

bauxite, iron, coal and water. The pressure to mine these resources, most of which overlap with dense forests, has already caused considerable loss of forest habitat and is triggering large scale land use change (Samata 2003; Oskarsson & Nielsen 2014). The lack of knowledge about the bare minimum attributes of biodiversity and ecology from the region hampers the ability of both the agencies and the civil society to take informed decisions about the impact of these projects on the ecology and biodiversity of the region.

The interactions of butterflies, as larvae and adults, with different sets of host plants and their sensitivity to micro-climate, moisture, topographic and light level changes makes them excellent ecological and environmental indicators (Murphy et al. 1990; Kremen 1992). Therefore, it is critical and urgent to document the butterfly diversity of these fragile, but biologically diverse and rich regions.

Most recent lists of butterflies from the Eastern Ghats have come from the central Eastern Ghats (Chandra et al. 2007) and southern Eastern Ghats (Harinath et al. 2014). We found numerous errors in identification and taxonomy of butterflies wherever they have provided images and therefore the quality of information in these studies is questionable. Earlier, Best (1954) had compiled a list of butterflies from Nagalapuram and Servarayan (anglicised as Shevaroy) Hills located in the southern Eastern Ghats in the present day Tamil Nadu. The Zoological Survey of India's Fauna of Andhra Pradesh series reported three new distribution records from Prakasam and Kadapa districts in 2007 (Majumdar 2007; Maulik 2007). Among the recent efforts to study the butterflies of the Eastern Ghats, the most significant has been the Eastern Ghats Insect Survey Project carried out by the Zoological Society of India's which resulted in a two volume edited report (Anonymous 1986a,b). These volumes had five chapters dedicated to butterfly fauna, the first two being list of collections from Javadi Hills, located in the Namakkal District of central Tamil Nadu (Khatri 1986d) and Kolli Hills, situated in the Vellore and Tiruvannamalai districts of Tamil Nadu (Khatri 1986a). The remaining two chapters describe the Nymphalid and Lycaenids of Eastern Ghats (Khatri 1986b,c). An additional chapter in volume 1 in the same report discusses some phenological and geographical variations in the butterflies from the Eastern Ghats (Khatri 1986e). Most of these surveys, however, have been focussed mostly in the Tamil Nadu sections of the Eastern Ghats, covering its southern parts. Very few studies have focussed on the butterfly fauna of the northern Eastern Ghats from Andhra Pradesh, and thus has remained comparatively under-explored, particularly in terms of its butterfly fauna.

In this paper, we present the first checklist of butterflies from the northern Eastern Ghats with notes on new and interesting records.

METHODS

Study area

The northern Eastern Ghats is spread over an area of 16,948.35km^2 in northern Andhra Pradesh covering the districts of Srikakulam, Vizianagaram, Visakhapatnam, East Godavari and West Godavari. The current study was conducted at two sites in the northern Eastern Ghats falling within Andhra Pradesh - the buffer area of Papikonda National Park (henceforth PNP) around Maredumilli and Araku Valley.

PNP (17.267–17.691 and 81.281–81.694) is located in the East and West Godavari districts of north, coastal Andhra Pradesh and is spread over an area of 1,012km^2. The dominant vegetation types in PNP are southern tropical mixed moist deciduous, along with some semi-evergreen and dry deciduous forest patches (Champion & Seth 1968). The topography is hilly and undulating with steep slopes with an elevation range of 20–850 m. Annual average precipitation is approximately 1,309mm with temperatures ranging from 15–45 ^{0}C.

About 200km north of PNP lies the Araku Valley (18.209–18.4420 and 82.700–83.115), a small hill station spread over an area of 36km^2, in the western part of Visakhapatnam District, Andhra Pradesh close to the border with Odisha. The elevation ranges from 930m in the Valley to 1,690m at Jindhagada Peak and is composed of a mosaic of semi-evergreen forests, coffee and pepper plantations and shifting cultivation plots, called 'podu' locally. The vegetation around the Valley is composed of moist deciduous forests with semi-evergreen patches with patches of degraded forest and scrubs (Champion & Seth 1968).

Survey sites

We opportunistically surveyed an area of approximately 100km^2 in the buffer area of PNP around Maredumilli between 21 July and 29 July 2015, and once again between 27 August and 29 August in 2016 (Table 1) at three specific localities—Jalatarangini, Kutravada and Maredumilli. Jalatarangini is located along the Rajahmundry-Jagdalpur highway (SH 41) at an elevation of 460m and forms the northeastern border of PNP. The habitat type is dense moist deciduous forest interspersed

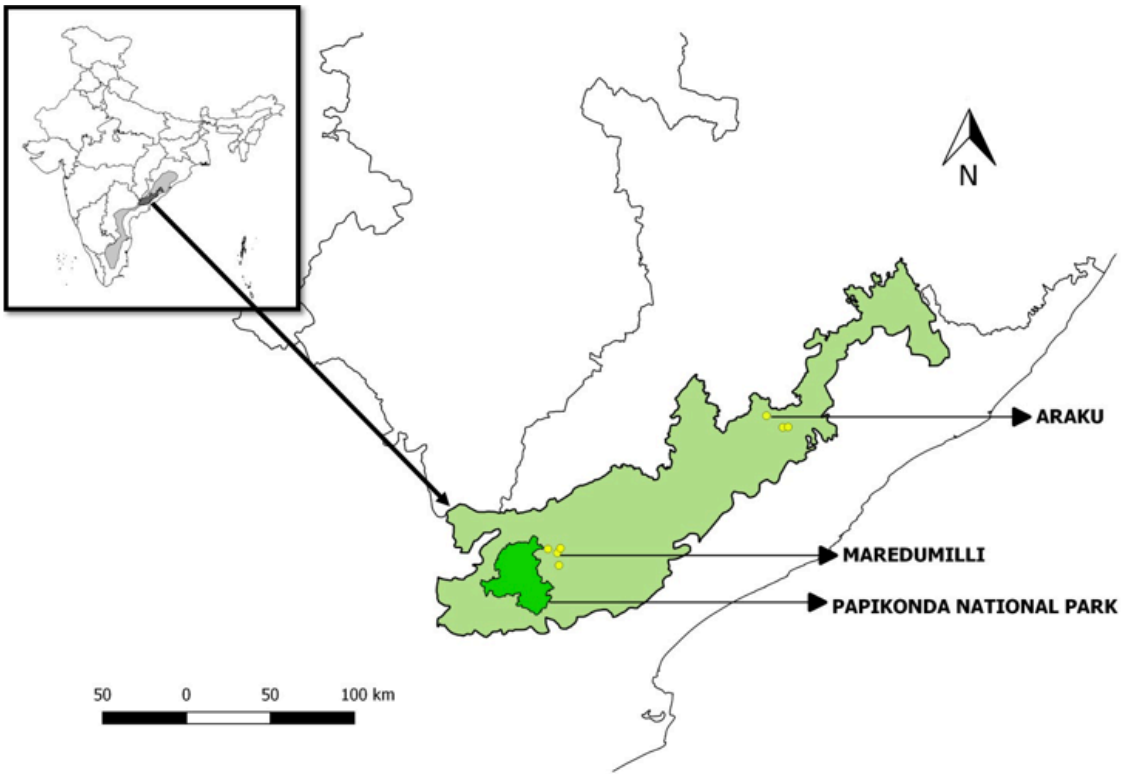

Figure 1. Study area map indicating the locations of the sites surveyed

with teak and coffee plantations. Kutravada is located about 7km northeast of Jalatarangini, at an elevation of 450m on the Maredumilli-Gurtedu Road. The locality is situated close to the Kutravada Village and is composed of moist deciduous forest and shifting cultivation plots, some of which has been planted with teak. Both of these localities are along the Pamuleru River, which forms the main drainage of PNP and is the second largest river within PNP after the Godavari. The third locality is close to Maredumilli Village surrounded by old teak plantations and secondary growth moist deciduous forests about 7km southeast of Maredumilli Village. It is located at an elevation of 400m along the Rajahmundry-Jagdalpur State Highway 41.

Table 1. Table showing the survey sites, localities, dates and number of days surveyed.

Sites	Localities	Survey dates	No of days surveyed
Buffer area of Papikonda National Park	Jalatarangini	21–29 July 2015, and 27–29 August 2016	12
	Kutravada		
	Maredumilli		
Araku Valley	Sunkarametta	30 July–2 August 2015	4
	Bisupuram		
Total Survey effort (in days)			**16**

In Araku Valley we surveyed two localities: Sunkarametta and Bisupuram from 30 July to 2 August 2015. Both are located close to the Visakhapatnam-Jeypore highway (Image 1). Sunkarametta is located about 15km from Araku at an elevation of 1,200m and is surrounded by coffee plantations interspersed with degraded moist deciduous forest patches. Bisupuram Village is located about 5km east of Sunkarametta at an elevation of 1,100m and is close to the Katiki waterfalls. The habitat is degraded moist deciduous forest interspersed with podus.

Data Collection

Intensive non-invasive butterfly surveys were carried out in the above mentioned six locations. The period of our survey coincided with the retreating south-west monsoons when the butterfly activity is known to peak. Owing to paucity of funds and limited time available, we decided to focus on the peak period for butterfly activity.

All possible habitat types in the survey areas were scanned for butterflies from 06.00hr to 18.00hr. Even though butterfly activity peaks during the late morning and noon, we surveyed during early mornings as well as late afternoons and evenings to include crepuscular species. The species which were difficult to identify in the field were photographed with good quality cameras

Image 1. Habitat of the surveyed sites: A - Araku, Sunkarametta Hills; B - Maredumilli, Jalatarangini waterfalls; C - Pamuleru River in the buffer area of Papikonda National Park; D - Maredumilli Teak Plantation

and later identified to species level wherever possible. We handled only those specimens which were found to be injured or dead.

Species were identified using Evans (1932), Wynter-Blyth (1957), and Kehimkar (2008, 2016). To confirm the various new records presented in this paper, ranging from the northern Eastern Ghats to peninsular India, we checked the known distribution of the species in question from three authoritative books by Evans (1932), Wynter-Blyth (1957), and Varshney & Smetacek (2015) . To further verify the new records for Eastern Ghats, we reviewed the published literature, namely, Best (1954), Khatri (1986a,b,c,d), Majumdar (2007), and Maulik (2007); while Majumdar (2007) and Maulik (2007) were scanned to cross-verify the new records for Andhra Pradesh. To check the unpublished photographic records, we scanned two expert-curated online portals-Butterflies of India (https://www.ifoundbutterflies.org) and India Biodiversity Portal (IBP, http://indiabiodiversity.org/). Both these portals allow users to access butterfly observations with information on the location and date of the records.

Finally, a checklist was prepared on the butterflies recorded from this region in which the species were arranged according to sub-families under each family. The names were listed alphabetically under each sub-family according to their genus and species.

RESULTS

We recorded a total of 102 species across six families. Nymphalidae was the most species-rich family with 38 species while only one species was recorded for Riodinidae (Table 2).

In the following text we provide notes on known distribution records of the new and significant butterfly records along with observation notes on their habit, habitat and commonness in the surveyed sites. Additionally, we provided detailed identification keys for cryptic species, particularly those which share similar morphological features with other species.

Family: Hesperiidae

Subfamily: Coeliadinae

***Bibasis sena* (Moore, [1866]) (Orange-tailed Awl)**

(Image 2(2))

This is the first report of this species from the Eastern Ghats. This species was encountered twice - inside a dense forest patch near Maredumilli early in the morning at 07:23hr on 18 July 2015 while a second individual was seen along the highway in a dense forest patch near Jalatarangini 06:39hr on 20 July 2015. So far from India, this species has been reported from the Western Ghats, central to eastern Himalaya and the northeast and is known to be rare throughout its range (Wynter-Blyth 1957). This species is listed within the Part II of Schedule II list of protected animals under the Indian Wildlife (Protection) Act (Anonymous 1972).

Table 2. Species richness across the six families of butterflies recorded during the survey

Family	No. of species
Nymphalidae	38
Lycaenidae	23
Hesperiidae	21
Pieridae	10
Papilionidae	9
Riodinidae	1

***Hasora badra* (Moore, [1858]) (Common Awl)**

This is the first record of this species from the Eastern Ghats. We observed this species nectaring near the small sluice gate dam on Pamuleru River near Kutravada, early in the morning on 29 August 2016. Previously, it was known to be distributed in the Western Ghats and northeastern India (Varshney & Smetacek 2015). This species was recorded from Bhitarkanika National Park, Kendrapara District, in Odisha which is not part of the Eastern Ghats (Kalesh et al. 2017).

***Hasora* sp. (An Awl sp.)** (Image 2(3)

This species was encountered frequently during our survey and we observed a total of eight individuals during our surveys of 2015 and 2016 in the area. Six individuals were recorded between 200–400 masl whereas two individuals (one male and one female) were seen at Araku Valley at 1,200m. The associated habitats ranged from semi-dense forests (deciduous) to small fragments of tree forests in coffee-plantation and meadows dominated landscape.

Earlier we suspected this species to be *Hasora leucospila* Mabille, 1891 based on the white band which extended slightly above the tornus in the hindwing and presence of purple sheen on its forewings. Moreover, its distribution was known from India: from the Andaman & Nicobar Islands and its recent report from Khurda District, Odisha in the northern Eastern Ghats (V. Sarkar pers. comm. 5 May 2017).

Both the main wing-based distinguishing character were clearly seen in the images of seven individuals we had photographed during the survey. In one of the images, we observed yellow hyaline spots in space two and three of the underside of forewings, indicating that it might be a female (Chiba 2009); however, when we tried to run the dichotomous identification key following Chiba (2009) to confirm species level identification, we found the presence of an apical white spot in the forewing of all the individuals that we had photographed during our survey. According to Chiba (2009) this characteristic goes against the morphological traits of *leucospila* species and in the absence of specimens, we couldn't conclusively run and complete the key. Therefore we retain this species as an unidentified *Hasora* sp.

***Hasora vitta* (Butler, 1870) (Plain Banded Awl)** (Image 2(4))

We recorded this species from a dense forest patch late in the evening on 20 July 2015, when it was feeding on trash deposited near the highway which passes through the PNP near Maredumilli. We also recorded this species at another location near Jalatarangini. This species is not common in its entire known range in India which includes the Western Ghats and adjoining areas from Maharashtra to Goa up to Kerala and northeast India (Evans 1932; Wynter-Blyth 1957; Varshney & Smetacek 2015). Apart from our record, the only other record from Eastern Ghats comes from an image of this species by Vivek Sarkar which is uploaded on IFB portal from Mundasaru in Kandhamal District of Odisha (Kunte 2017). So far, based on the existing reports, this species seems to be restricted to the northern parts of Eastern Ghats.

Family: Hesperiidae

Sub family: Hesperiinae

***Cupitha purreea* (Moore, 1877) (Wax Dart)**

(Image 2(6))

Our record of *Cupitha purreea* during this survey is the first report of this species from the Eastern Ghats. We observed only one individual of this species from an old regenerating 'podu' (local name for shifting agriculture) forest with lots of lianas, close to Pamuleru River near Maredumilli on 20 July 2015.

The known Indian distribution of this species is along the Western Ghats from Maharashtra to Kerala, eastern Himalaya, northeastern India and the Andaman Islands (Wynter-Blyth 1957; Varshney & Smetacek 2015). Globally, its range extends up to Sulawesi from Thailand, Laos, Langkawi, Malaysia, Borneo, Sumatra, Java, and the Philippines (Moore 1877, 1884; Piepers et al. 1910; Corbet & Pendlebury 1992; Vane-Wright & de Jong 2003). This species is not common throughout its range.

***Iambrix salsala* (Moore, [1866]) (Chestnut Bob)** (Image 3(1))

We recorded several individuals of this species on 18, 19 and 20 July 2017, from a riparian forest habitat flanked by shade coffee plantations near Maredumilli, in the northern Eastern Ghats. Apart from our record,

Image 2. Hersperiidae butterflies belonging to subfamilies Coeliadinae: 1. *Badamia exclamationis*, 2. *Bibasis sena*, 3. *Hasora* sp., 4. *Hasora vitta*; Hesperiinae: 5. *Oriens goloides*, 6. *Cupitha purreea*

the only other record of this species from the Eastern Ghats is that by Subramanium Kalluri (SK) from the same location in December 2010 (Kandoth 2018). The species is common in northeastern India where it can be seen in urban and semi-urban gardens as well as in the open areas, cultivations and plantation near forests and forest edges. All records of this species in India Biodiversity Portal, (IBP) (Goswami 2017) and Butterflies of India web portal (BOI) (Kandoth 2018), baring the one mentioned above, is restricted to the northeast, southern Bengal, the Western Ghats, eastern and central part of Karnataka and eastern Tamil Nadu. According to Varshney & Smetacek (2015) the species is distributed from Gujarat to Kerala and Uttarakhand to northeastern India.

***Matapa aria* (Moore, [1866]) (Common Redeye)** (Image 3(2))

In the northern Eastern Ghats, only one record of this species was obtained within the campus of the Forest Guest House at Maredumilli on 20 July 2015. This is the first record of this species from the Eastern Ghats. This species was earlier known from northern India (Uttarakhand, Delhi) and northeastern India, southern Bengal and southern India (Varshney & Smetacek 2015; Wynter-Blyth 1957). The species is common in its range in northeastern India and the Western Ghats.

***Potanthus* sp. (Dart)** (Image 3(4))

We recorded several individuals of *Potanthus* genus around Maredumilli beween 18 and 23 July 2015. There are no recent records of any species from the *Potanthus* genus from the Eastern Ghats or southern

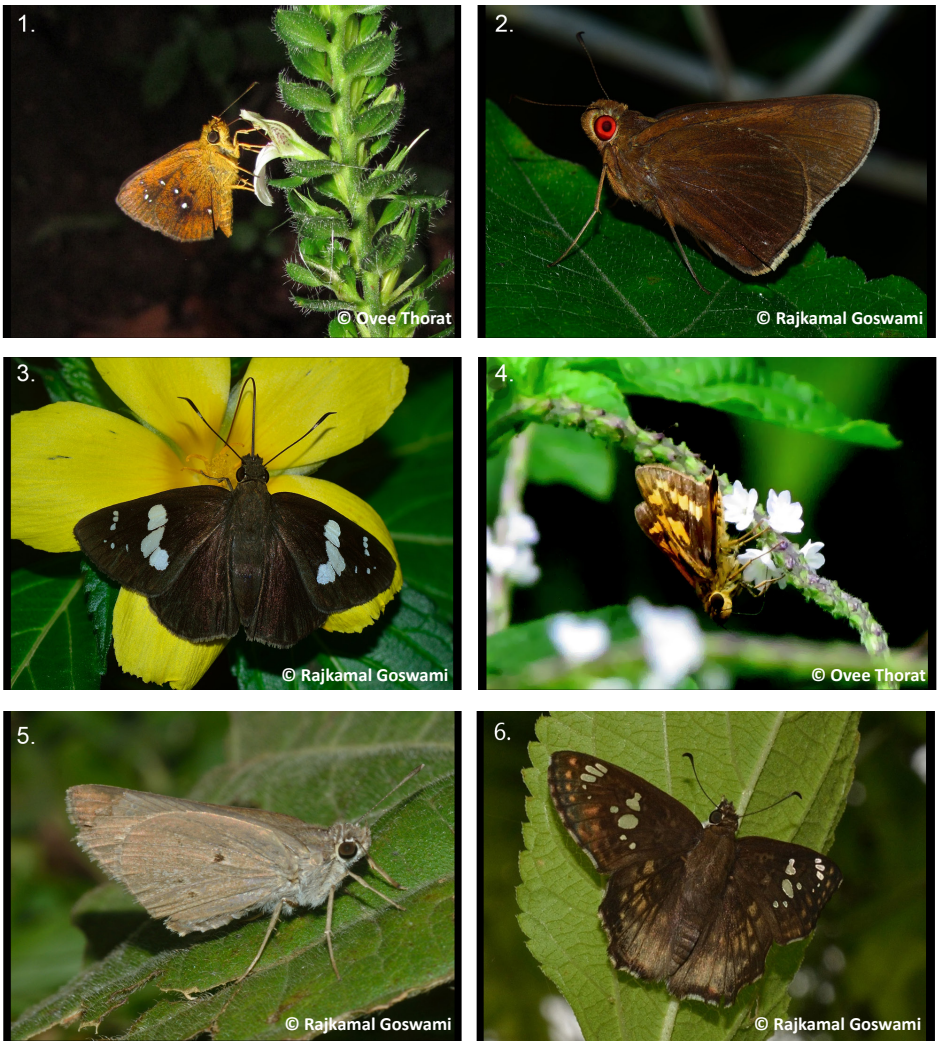

Image 3. Hersperiidae butterflies belonging to subfamilies Hesperiinae: 1. *Iambrix salsala*, 2. *Matapa aria*, 3. *Notocrypta curvifascia*, 4. *Potanthus* sp., 5. *Suastus gremius*; Hesperiinae: 6. *Caprona ransonnettii*

Bengal. Specimens of this genus from Eastern Ghats needs to be collected and examined to determine species level distribution in the Eastern Ghats. Species level identification is difficult based on wing patterns and external morphological characteristics in this genus. Among the most abundant species of this genus, two species are known to occur in peninsular India and its hill ranges. *P. pseudomaesa* is known to be distributed from Jammu & Kashmir to northeastern India, Uttar Pradesh, Rajasthan, Madhya Pradesh and southwards down to Kerala (Varshney & Smetacek 2015). *P. palnia* is known from Karnataka and Kerala (Varshney & Smetacek 2015) while Wynter-Blyth (1957) recorded its distribution from the southern Indian hills.

Hersperiidae

Subfamily: Pyrginae

***Odontoptilum angulatum* (Felder, 1862) (Chestnut Angle)** (Image 4(1))

This is the first record of this species from the Eastern Ghats. We encountered only one individual of this species around the damp areas of moist deciduous forest during the survey on 20 July 2015 indicating that it might be rare in the Eastern Ghats. This butterfly is fairly common within its known range of the Western Ghats (Maharashtra to Kerala), western and central Himalaya, eastern Himalaya and the northeast (Wynter-Blyth 1957; Varshney & Smetacek 2015).

The known range of this species, which is closest to the Eastern Ghats, is from a record from Simlipal National Park in Odisha (Saji & Chandrashekharan 2017). Best (1954) did not record this from his survey

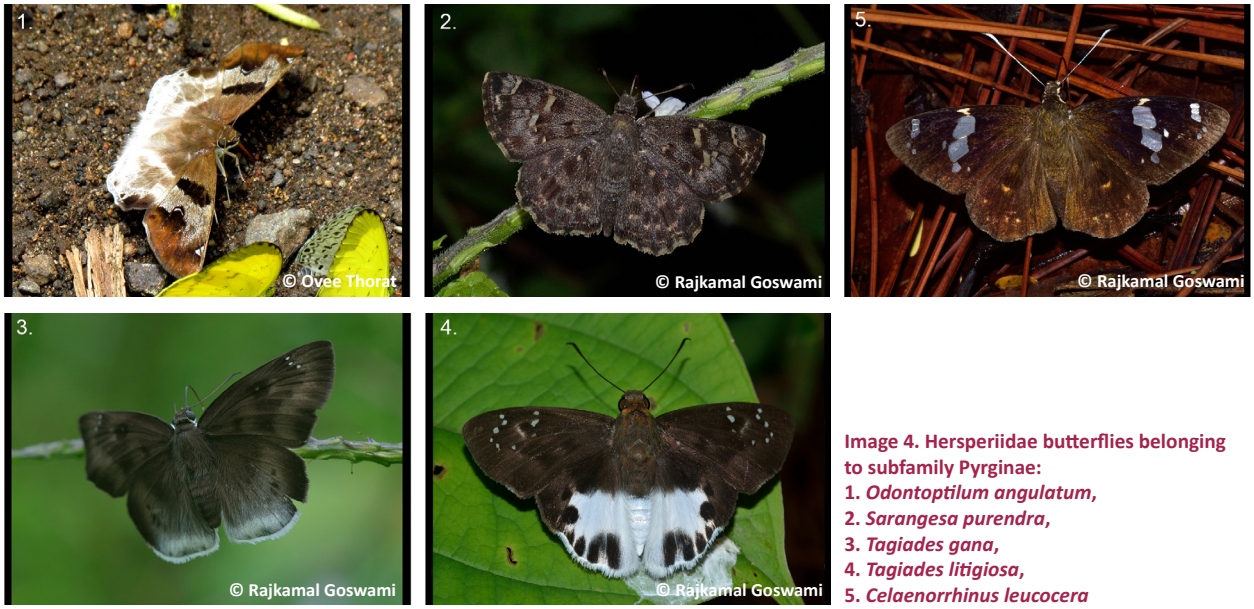

Image 4. Hersperiidae butterflies belonging to subfamily Pyrginae:
1. *Odontoptilum angulatum*,
2. *Sarangesa purendra*,
3. *Tagiades gana*,
4. *Tagiades litigiosa*,
5. *Celaenorrhinus leucocera*

of Nagalapuram Hills in southern Andhra Pradesh. The preferred habitat of this species is moist forests. In the Eastern Ghats, such forests mostly occur in the northern Eastern Ghats. Therefore, it is likely that the distribution of this species within the Eastern Ghats is probably restricted to the moist forests of northern Eastern Ghats.

***Sarangesa purendra* Moore, 1882 (Spotted Small Flat)** (Image 4(2))

Our observation of three individuals of this species on 18 July 2018 is the first report of this species from the Eastern Ghats. This species was sighted along the forest edges close to the Jalatarangini waterfall frequently during our July 2015 and August 2016 surveys in the area indicating that the species is locally common. The known distribution of this species is from northern Karnataka in the south till Maharashtra, Gujarat and Sindh region (Wynter-Blyth 1957). It has also been reported from Himachal Pradesh and Uttarakhand (Varshney & Smetacek 2015). It is not rare throughout its range.

Hersperiidae
Family: Lycaenidae
Subfamily: Polyommatinae
***Nacaduba berenice* (Herrich-Schäffer, 1869) (Rounded six-lineblue)** (Image 6(1))

Our observation of the species from Araku Valley near Katiki waterfall on 26 July is the first report of this species from the Eastern Ghats.

Two sub-species of *N. berenice* are reported from India. *N.b. nicobaricus* (Wood-Mason & de Niceville 1881) is distributed in the Andaman & Nicobar Islands while *N. b. plumbeomicans* (Wood-Mason & de Niceville 1881)'s distribution so far has been reported from Karnataka, Tamil Nadu, Kerala, Andaman & Nicobar Islands and northeastern India (Varshney & Smetacek 2015).

The species belongs to the six-lineblue group of butterflies which are difficult to identify in the field and without careful and technical diagnosis of its morphology can be easily misidentified as one of three very similar species with overlapping distributions - *N. kurava* Moore, 1858 (Transparent six-lineblue), *N. beroe* C. & R. Felder, 1865 (Opaque six-lineblue), and *N. calauria* C. Felder, 1860, (Dark Ceylon six-lineblue).

The main distinguishing features of *N. berenice* are rounded termen of fore and hindwings and the lack of zig-zagged lunules at the outer-discal region on the forewings (Wynter-Blyth 1957). Another identification key, which sets this species apart from the other two similar species, is the inner line of the discal area which joins the lower ends of the outer line of the cell-ending region (Evans 1932).

Lycaenidae
Subfamily: Theclinae
***Loxura atymnus* (Stoll, 1780) (Yamfly)** (Image 6(6))

Our report of *L. atymnus* from Maredumilli is its first record from the northern Eastern Ghats. Two individuals of this species were observed on 18 July 2018. This species is not uncommon throughout its range which

Image 5. Lycaenidae butterflies belonging to subfamily Polyommatini: 1. *Acytolepis puspa*, 2. *Caleta elna*, 3. *Castalius rosimon*, 4. *Chilades lajus*, 5. *Chilades pandava*, 6. *Euchrysops cnejus*

includes the Western Ghats from Maharashtra to Kerala, central India (Bihar, Jharkhand and Madhya Pradesh), and in northern India (Uttarakhand) to northeastern India, along with the Andaman & Nicobar Island (Evans 1932; Varshney & Smetacek 2015; Wynter-Blyth 1957). Wynter-Blyth (1957) has reported this species from the Servarayan Hills (anglicised as Shevaroy by Wynter-Blyth) which forms one of the southernmost parts of the Eastern Ghats and is part of Tamil Nadu.

Family: Nymphalidae

Subfamily: Cyrestinae

***Cyrestis cocles* (Fabricius, 1787) (Marbled Map)** (Image 8(1))

Our observation of this species on 20 July 2015 is its first record from Eastern Ghats. The species was observed mud-puddling at an elevation of 400m in a hill stream surrounded by dense forest patch near the Jalatarangini water fall. The location is frequently visited by tourists and is highly disturbed. This rare nymphalid is known from the northeast region of India including Sikkim along with southern part of Bihar and Odisha, which was its southernmost limit. So far, this is the southernmost limit of this species in India.

In the northeast too, this species has been recorded from areas with high human activity. This species is listed within the Part II of Schedule II list of protected animals under the Indian Wildlife (Protection) Act (Anonymous 1972).

Subfamily: Danainae

***Euploea sylvester* (Fabricius, 1793) (Double Branded Crow)** (Image 8(6))

This is the first record of this species from the

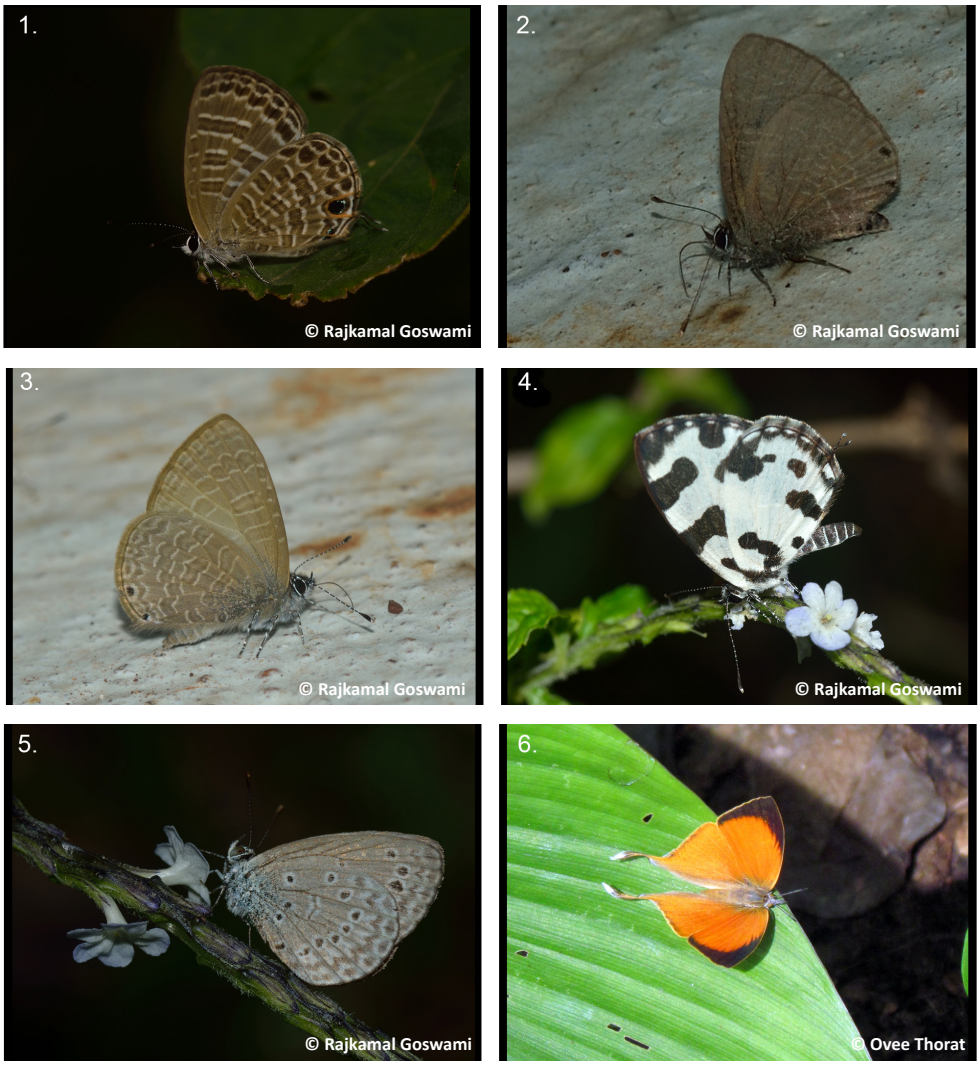

Image 6. Lycaenidae butterflies belonging to subfamilies Polyommatini: 1. *Nacaduba berenice*, 2. *Petrelaea dana*, 3. *Prosotas dubiosa*, 4. *Caleta decidia*, 5. *Zizeeria karsandra*; Theclinae: 6. *Loxura atymnus*

Image 7. Lycaenidae butterflies belonging to subfamily Theclinae 1. *Spindasis syama*, 2. *Spindasis vulcanus*, 3. *Zeltus amasa*

northern Eastern Ghats. We observed a dead specimen of this species on the 20 July 2015. The specimen was found on the tar road and was probably a case of roadkill. On examination, the specimen was found to be *E.s. coreta* as it had the two parallel long brands on the upper side of the forewings (Image 8(6)).

The subspecies *E.s. coreta* Godart, 1819 was found mud-puddling in damp patches on the side of the roads

Image 8. Nymphalidae butterflies belonging to subfamilies Cyrestinae: 1. *Cyrestis cocles*; Heliconiinae: 2. *Phalanta phalantha*; Charaxinae: 3. *Charaxes bharata*, 4. *Charaxes solon*; Danainae: 5. *Euploea mulciber*, 6. *Euploea sylvester*

along the denser part of the forest around Maredumilli. This species, although locally 'very common', particularly during the rainy and immediately after the rainy season throughout its range, hasn't been reported yet from the northern Eastern Ghats (Wynter-Blyth 1957), probably because the species is almost indistinguishable from *E. core* based on the underside wing-markings. Thus, it might have gone unreported.

Nymphalidae

Subfamily: Limenitidinae

***Neptis sappho* (Pallas, 1771) (Pallas' Sailer)**

(Image 10(1))

This is the first record of this species from Peninsular India. We observed several individuals during our surveys in July 2015 and August 2016. This species was encountered at about 1,100m in the highly degraded forest in Araku Valley near the Katiki Waterfall as well as at 400m in and around Maredumilli. The species is very similar to the Common Sailer (*N. hylas*) which we have also recorded from the northern Eastern Ghats; however the characteristics based on which *N. sappho* could be distinguished from *N. hylas*—(the veins in the UNH-under-hindwing is not blackened and in the forewing not blackened at least till cell) (Evans 1932)—could be photographed and therefore could be correctly identified. The species was found to be uncommon in the sites we recorded them from.

Our record of this species represents a significant range extension, adding a new species to the list of butterflies of peninsular India. From India, this species was so far known from western, central and eastern Himalaya and the northeastern region (Varshney & Smetacek 2015).

Image 9. Nymphalidae butterflies belonging to subfamilies Danainae: 1. *Parantica aglea*; Limenitidinae: 2. *Symphaedra nais*, 3. *Tanaecia lepidea*, 4. *Athyma nefte*, 5. *Athyma perius*, 6. *Athyma selenophora*

Nymphalidae
Subfamily: Satyrinae
***Lethe drypetis* (Hewitson, 1863) (Tamil Treebrown)**
(Image 11(2))

Our record of this species on the 28 August 2016 from Maredumilli and Jalatarangini water fall sites is the first record of this species from the Eastern Ghats. We observed four individuals during 2015 and another two during 2016 around the same locations in wet riparian vegetation. On both the days, rain had preceded our visit and the species was recorded resting in the shady understory. The species seemed to be locally common.

The subspecies *L.d. todara* Moore, 1881 is found in India and is distributed in the Western Ghats from Goa to Kerala and the states of Chhattisgarh and Odisha (Varshney & Smetacek 2015).

Papilionidae
Subfamily: Papilioninae
***Graphium eurypylus* (Linnaeus, 1758) (Great Jay)**
(Image 12(2))

Our observation of a single individual of *Graphium eurypylus* on 19 July 2015, mud puddling among yellows, papilionids and hedge blues in a damp teak plantation close to Maredumilli forest campus, is the first report of this species from peninsular India. Our record represents a significant range extension of the species from its current known range in the eastern Himalaya and the northeast of India (Varshney & Smetacek, 2015). The subspecies *G.e. macronius* Jordan, 1909 has been reported from the Andaman Islands.

Morphologically, in terms of wing markings and patterns, the species is similar to *Graphium evemon* (Boisduval, 1836) and *Graphium doson* (Felder & Felder,

Image 10. Nymphalidae butterflies belonging to subfamily Limenitidinae: 1. *Neptis sappho*, and Nymphalinae: 2. *Hypolimnas bolina*, 3. *Junonia iphita*, 4. *Junonia lemonias*, 5. *Kallima inachus*, 6. *Symbrenthia lilaea*

1864). The key characters in the underwing patterns, which distinguish it from the two similar species, could be detected from the images we shot. On the underside hindwing of this species, the costal bar is joined to the dark basal band across the cell and that the extreme end of the cell is red instead of brown (Evans 1932; Wynter-Blyth 1957). In very rare cases when the costal band in the UNH is not joined to the basal bar, then the basal margin of the silver band between them is notched (Evans 1932). This species is listed within the Part II of Schedule II list of protected animals under the Indian Wildlife (Protection) Act (Anonymous 1972).

***Papilio helenus* Linnaeus, 1758 (Red Helen)**

Our record of *P. helenus* from Maredumilli on 19 July 2015 is its first report from the northern Eastern Ghats. The species has not been recorded from Odisha or southern Bengal yet.

A relatively common butterfly of the forests, *P. helenus* is widely distributed across India. It has been reported from western and central Himalaya, eastern Himalaya and northeast and peninsular India (Evans 1932; Wynter-Blyth 1957; Varshney & Smetacek 2015). Within peninsular India, the butterfly so far has been reported from the Western Ghats, southern Eastern Ghats from the Servarayan Hills and Bangalore.

***Papilio polymnestor* (Cramer, 1775) (Blue Mormon)** (Image 12(6))

Our record of this species from multiple locations around Maredumilli, is its first report from the northern Eastern Ghats. We observed the species during morning and late afternoon nectaring around the forest edges close to streams and rivers on all days during our survey

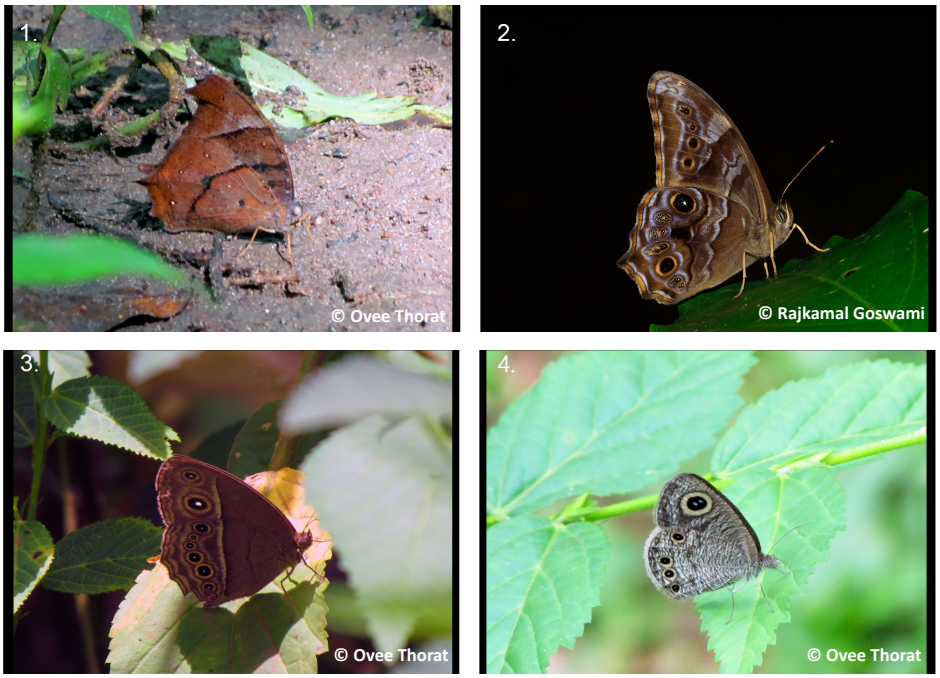

Image 11. Nymphalidae butterflies belonging to subfamily Satyrini
1. *Melanitis leda*,
2. *Lethe drypetis*,
3. *Mycalesis mineus*,
4. *Ypthima huebneri*

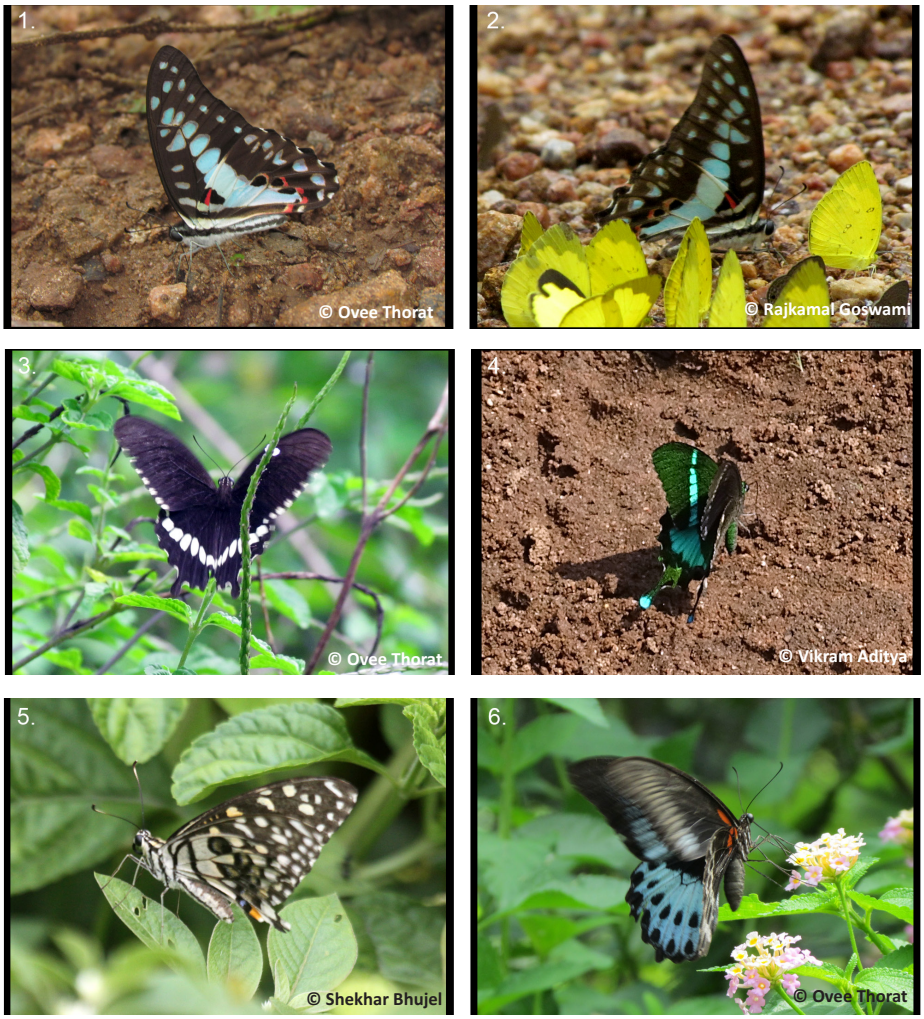

Image 12. Papilionidae butterflies belonging to subfamily Papilioninae
1. *Graphium doson*,
2. *Graphium eurypylus*,
3. *Papilio polytes*,
4. *Papilio crino*,
5. *Papilio demoleus*,
6. *Papilio polymnestor*

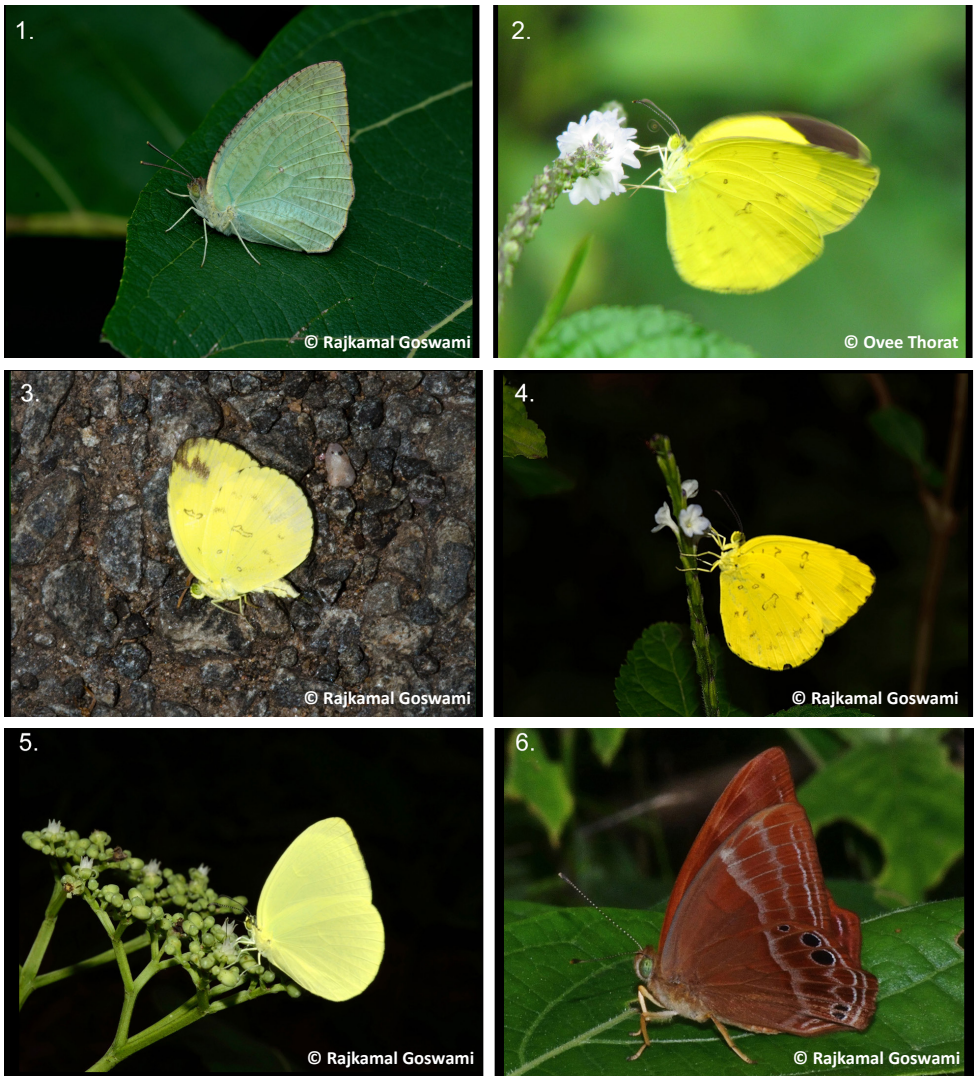

Image 13. Pieridae butterflies belonging to subfamily Coliadinae: 1. *Catopsilia pyranthe*, 2. *Eurema hecabe*, 3. *Eurema andersonii*, 4. *Eurema blanda*, 5. *Gandaca harina*, and a Riodinidae butterfly belonging to the subfamily Nemeobiina: 6. *Abisara bifasciata*

periods in 2015 and 2016.

P. polymnestor is a large common butterfly in peninsular India and found in urban, rural as well as edges of forested areas. Although the butterfly is believed to be endemic to peninsular India (Kunte & Gadgil 2000), its occurrence has been reported from as far as Sikkim, southern Bihar, West Bengal (Wynter-Blyth 1957) as well as neighbouring Bangladesh (Larsen 2004). RG has also recorded this species from Nongpoh located in the northern Khasi Hills, Meghalaya at 600m.

From the Eastern Ghats, there is only one previous record of this species by Best (1954) from the Nagalapuram Hills in southern Andhra Pradesh, close to the Tamil Nadu border.

Pieridae

Subfamily: *Coliadinae*

***Eurema andersonii* (Moore, 1886) (One-spot Grass Yellow)** (Image 13(3))

Our record of one specimen of *Eurema andersonii* on 18 July 2015, which lay injured on the SH 41 near Rampachodavaram probably after being hit by a vehicle, is its first report from northern Eastern Ghats. On both sides of the roads were teak plantations of variable age. This is the only record of this species we have got so far from our entire survey effort.

This butterfly's known distribution in India so far ranges from Uttarakhand, central Himalayan region, northeast, and the states of Karnataka, Kerala, Tamil Nadu in peninsular India and the South Andaman Islands (Varshney & Smetacek 2015; Sondhi & Kunte 2018).

Table 3. List of butterflies recorded during the survey along with their schedule according to the Wildlife Protection Act (1972). New species records for Peninsular India, Entire Eastern Ghats, northern Eastern Ghats and Andhra Pradesh are indicated with 'X' mark. WPA 1972=Wildlife Protection Act (1972). PI - Peninsular India; EEG - Entire Eastern Ghats; NEG - northern Eastern Ghats; AP - Andhra Pradesh

	Image number	Common name	Scientific name	Family	Subfamily	Tribe	New species record				Schedule Species -WPA, 1972
							PI	EEG	NEG	AP	
1	Image 2(1)	Brown Awl	*Badamia exclamationis* (Fabricius, 1775)	Hesperiidae	Coeliadinae						
2	Image 2(2)	Orange-tailed Awl	*Bibasis sena* (Moore, [1866])	Hesperiidae	Coeliadinae			X	X	X	Sch II (Part II)
3		Common Awl	*Hasora badra* (Moore, [1858])	Hesperiidae	Coeliadinae						
4		Common banded Awl	*Hasora chromus* (Cramer, 1780)	Hesperiidae	Coeliadinae						
5	Image 2(3)	Aw sp.	*Hasora sp.*	Hesperiidae	Coeliadinae						
6	Image 2(4)	Plain banded Awl	*Hasora vitta* (Butler, 1870)	Hesperiidae	Coeliadinae					X	Sch IV
7	Image 2(5)	Ceylon Dartlet	*Oriens goloides* (Moore, [1881])	Hesperiidae	Hesperiinae	Taractrocerini					
8	Image 2(6)	Wax Dart	*Cupitha purreea* (Moore, 1877)	Hesperiidae	Hesperiinae	Aeromachini		X	X	X	
9	Image 3(1)	Chestnut Bob	*Iambrix salsala* (Moore, [1866])	Hesperiidae	Hesperiinae	Aeromachini					
10	Image 3(2)	Common Redeye	*Matapa aria* (Moore, [1866])	Hesperiidae	Hesperiinae	Aeromachini		X	X	X	
11	Image 3(3)	Restricted Demon	*Notocrypta curvifascia* (Felder & Felder, 1862)	Hesperiidae	Hesperiinae	Aeromachini					
12	Image 3(4)	Dart sp.	*Potanthus* sp.	Hesperiidae	Hesperiinae	Aeromachini					
13	Image 3(5)	Indian Palm Bob	*Suastus gremius* (Fabricius, 1798)	Hesperiidae	Hesperiinae	Aeromachini					
14	Image 3(6)	Golden Angle	*Caprona ransonnettii* (Felder, 1868)	Hesperiidae	Pyrginae	Tagiadini					
15	Image 4(1)	Chestnut Angle	*Odontoptilum angulatum* (Felder& Felder, 1862)	Hesperiidae	Pyrginae	Tagiadini				X	
16		Common Small Flat	*Sarangesa dasahara* (Moore, [1866])	Hesperiidae	Pyrginae	Celaenorrhinini					
17	Image 4(2)	Spotted Small Flat	*Sarangesa purendra* Moore, 1882	Hesperiidae	Pyrginae	Celaenorrhinini		X	X	X	
18	Image 4(3)	Suffused Snow Flat	*Tagiades gana* (Moore, [1866])	Hesperiidae	Pyrginae	Tagiadini					
19		Common Snow Flat	*Tagiades japetus* (Stoll, [1781])	Hesperiidae	Pyrginae	Tagiadini					
20	Image 4(4)	Water Snow Flat	*Tagiades litigiosa* Möschler, 1878	Hesperiidae	Pyrginae	Tagiadini					
21	Image 4(5)	Common Spotted Flat	*Celaenorrhinus leucocera* (Kollar, [1844])	Hesperiidae	Pyrginae	Celaenorrhinini					
22	Image 5(1)	Common Hedge Blue	*Acytolepis puspa* (Horsfield, [1828])	Lycaenidae	Polyommatinae	Polyommatini					
23		Common Ciliate Blue	*Anthene emolus* (Godart, [1824])	Lycaenidae	Polyommatinae	Polyommatini					
24	Image 5(2)	Elbowed Pierrot	*Caleta elna* (Hewitson, 1876)	Lycaenidae	Polyommatinae	Polyommatini					
25	Image 5(3)	Common Pierrot	*Castalius rosimon* (Fabricius, 1775)	Lycaenidae	Polyommatinae	Polyommatini					
26	Image 5(4)	Lime Blue	*Chilades lajus* (Stoll, [1780])	Lycaenidae	Polyommatinae	Polyommatini					
27	Image 5(5)	Plains Cupid	*Chilades pandava* (Horsfield, [1829])	Lycaenidae	Polyommatinae	Polyommatini					
28	Image 5(6)	Gram Blue	*Euchrysops cnejus* (Fabricius, 1798)	Lycaenidae	Polyommatinae	Polyommatini					Sch II (Part II)
29		Metallic Cerulean	*Jamides alecto* (Felder, 1860)	Lycaenidae	Polyommatinae	Polyommatini					

	Image number	Common name	Scientific name	Family	Subfamily	Tribe	New species record				Schedule Species -WPA, 1972
							PI	EEG	NEG	AP	
30		Dark Cerulean	*Jamides bochus* (Stoll, [1782])	Lycaenidae	Polyommatinae	Polyommatini					
31		Common Cerulean	*Jamides celeno* (Cramer, [1775])	Lycaenidae	Polyommatinae	Polyommatini					
32	Image 6(1)	Rounded Six-Line Blue	*Nacaduba berenice* (Herrich-Schäffer, 1869)	Lycaenidae	Polyommatinae	Polyommatini		X	X	X	
33	Image 6(2)	Dingy Lineblue	*Petrelaea dana* (de Nicéville, [1884])	Lycaenidae	Polyommatinae	Polyommatini					
34	Image 6(3)	Tailless Lineblue	*Prosotas dubiosa* (Semper, [1879])	Lycaenidae	Polyommatinae	Polyommatini					
35		Common Lineblue	*Prosotas nora* (Felder, 1860)	Lycaenidae	Polyommatinae	Polyommatini					
36		Red Pierrot	*Talicada nyseus* (Guérin-Méneville, 1843)	Lycaenidae	Polyommatinae	Polyommatini					
37	Image 6(4)	Angled Pierrot	*Caleta decidia* (Hewitson, 1876)	Lycaenidae	Polyommatinae	Polyommatini					
38	Image 6(5)	Dark Grass Blue	*Zizeeria karsandra* (Moore, 1865)	Lycaenidae	Polyommatinae	Polyommatini					
39		Common Acacia Blue	*Surendra quercetorum* (Moore, [1858])	Lycaenidae	Theclinae	Arhopalini					
40		Purple Leafblue	*Amblypodia anita* Hewitson, 1862	Lycaenidae	Theclinae	Amblypodiini					
41	Image 6(6)	Yamfly	*Loxura atymnus* (Stoll, 1780)	Lycaenidae	Theclinae	Loxurini			X	X	
42	Image 7(1)	Club Silverline	*Spindasis syama* (Horsfield, 1829)	Lycaenidae	Theclinae	Aphnaeini					
43	Image 7(2)	Common Silverline	*Spindasis vulcanus* (Fabricius, 1775)	Lycaenidae	Theclinae	Aphnaeini					
44	Image 7(3)	Fluffy Tit	*Zeltus amasa* (Hewitson, 1865)	Lycaenidae	Theclinae	Hypolycaenini					
45		Angled Castor	*Ariadne ariadne* (Linnaeus, 1763)	Nymphalidae	Biblidinae	Biblidini					
46		Common Castor	*Ariadne merione* (Cramer, [1777])	Nymphalidae	Biblidinae	Biblidini					
47	Image 8(1)	Marbled Map	*Cyrestis cocles* Fabricius, 1787	Nymphalidae	Cyrestinae	Cyrestini				X	Sch II (Part II)
48		Tawny Coster	*Acraea terpsicore* (Linnaeus, 1758)	Nymphalidae	Heliconiinae	Acraeini					
49	Image 8(2)	Common Leopard	*Phalanta phalantha* (Drury, [1773])	Nymphalidae	Heliconiinae	Vagrantini					
50	Image 8(3)	Indian Nawab	*Charaxes bharata* (Felder & Felder, 1867)	Nymphalidae	Charaxinae	Charaxini					
51	Image 8(4)	Black Rajah	*Charaxes solon* (Fabricius, 1793)	Nymphalidae	Charaxinae	Charaxini					
52		Plain Tiger	*Danaus chrysippus* (Linnaeus, 1758)	Nymphalidae	Danainae	Danaini					
53		Striped Tiger	*Danaus genutia* (Cramer, [1779])	Nymphalidae	Danainae	Danaini					
54		Common Crow	*Euploea core* (Cramer, [1780])	Nymphalidae	Danainae	Danaini					
55	Image 8(5)	Striped Blue Crow	*Euploea mulciber* (Cramer, [1777])	Nymphalidae	Danainae	Danaini					Sch IV
56	Image 8(6)	Double branded Crow	*Euploea sylvester* (Fabricius, 1793)	Nymphalidae	Danainae	Danaini			X	X	
57	Image 9(1)	Glassy Tiger	*Parantica aglea* (Stoll, [1782])	Nymphalidae	Danainae	Danaini					
58		Blue Tiger	*Tirumala limniace* (Cramer, [1775])	Nymphalidae	Danainae	Danaini					
59		Dark Blue Tiger	*Tirumala septentrionis* (Butler, 1874)	Nymphalidae	Danainae	Danaini					
60		Large Yeoman	*Cirrochroa aoris* (Doubleday, [1847])	Nymphalidae	Heliconiinae	Vagrantini					

	Image number	Common name	Scientific name	Family	Subfamily	Tribe	New species record				Schedule Species -WPA, 1972
							PI	EEG	NEG	AP	
61	Image 9(2)	Baronet	*Symphaedra nais* (Forster, 1771)	Nymphalidae	Limenitidinae	Adoliadini					
62	Image 9(3)	Grey Count	*Tanaecia lepidea* (Butler, 1868)	Nymphalidae	Limenitidinae	Adoliadini					
63	Image 9(4)	Colour Sergeant	*Athyma nefte* (Westwood, 1850)	Nymphalidae	Limenitidinae	Limenitidini					
64	Image 9(5)	Common Sergeant	*Athyma perius* (Linnaeus, 1758)	Nymphalidae	Limenitidinae	Limenitidini					
65	Image 9(6)	Staff Sergeant	*Athyma selenophora* (Kollar, [1844])	Nymphalidae	Limenitidinae	Limenitidini					
66		Commander	*Moduza procris* (Cramer, [1777])	Nymphalidae	Limenitidinae	Limenitidini					
67	Image 10(1)	Pallas' Sailer	*Neptis sappho* (Pallas, 1771)	Nymphalidae	Limenitidinae	Limenitidini	X	X	X	X	
68		Common Sailer	*Neptis hylas* (Linnaeus, 1758)	Nymphalidae	Limenitidinae	Neptini					
69	Image 10(2)	Great Eggfly	*Hypolimnas bolina* (Linnaeus, 1758)	Nymphalidae	Nymphalinae	Junoniini					
70		Danaid Eggfly	*Hypolimnas misippus* (Linnaeus, 1764ŽŽ)	Nymphalidae	Nymphalinae	Junoniini					Sch II (Part II)
71		Grey Pansy	*Junonia atlites* (Linnaeus, 1763)	Nymphalidae	Nymphalinae	Junoniini					
72	Image 10(3)	Chocolate Pansy	*Junonia iphita* (Cramer, [1779])	Nymphalidae	Nymphalinae	Junoniini					
73	Image 10(4)	Lemon Pansy	*Junonia lemonias* (Linnaeus, 1758)	Nymphalidae	Nymphalinae	Junoniini					
74	Image 10(5)	Orange Oakleaf	*Kallima inachus* (Boisduval, 1846)	Nymphalidae	Nymphalinae	Kallimini					
75	Image 10(6)	Common Jester	*Symbrenthia lilaea* (Hewitson, 1864)	Nymphalidae	Nymphalinae	Nymphalini					
76		Common Palmfly	*Elymnias hypermnestra* (Linnaeus, 1763)	Nymphalidae	Satyrinae	Elymniini					
77	Image 11(1)	Common Evening-brown	*Melanitis leda* (Linnaeus, 1758)	Nymphalidae	Satyrinae	Melanitini					
78	Image 11(2)	Tamil Treebrown	*Lethe drypetis* (Hewitson, 1863)	Nymphalidae	Satyrinae	Satyrini		X	X	X	
79	Image 11(3)	Dark-brand Bushbrown	*Mycalesis mineus* (Linnaeus, 1758)	Nymphalidae	Satyrinae	Satyrini					
80		Common Bushbrown	*Mycalesis perseus* (Fabricius, 1775)	Nymphalidae	Satyrinae	Satyrini					
81	Image 11(4)	Common Four-ring	*Ypthima huebneri* Kirby, 1871	Nymphalidae	Satyrinae	Satyrini					
82		Common Lascar	*Pantoporia hordonia* (Stoll, [1790])	Nymphalidae							
83		Common Bluebottle	*Graphium sarpedon* (Linnaeus, 1758)	Papilionidae	Papilioninae	Leptocircini					
84	Image 12(2)	Great Jay	*Graphium eurypylus* (Linnaeus, 1758)	Papilionidae	Papilioninae	Leptocircini	X	X	X	X	
85	Image 12(1)	Common Jay	*Graphium doson* (Felder & Felder, 1864)	Papilionidae	Papilioninae	Leptocircini					
86		Red Helen	*Papilio helenus* Linnaeus, 1758	Papilionidae	Papilioninae	Papilionini			X	X	
87		Common Mime	*Papilio clytia* Linnaeus, 1758	Papilionidae	Papilioninae	Papilionini					
88	Image 12(3)	Common Mormon	*Papilio polytes* Linnaeus, 1758	Papilionidae	Papilioninae	Papilionini					
89	Image 12(4)	Common-banded Peacock	*Papilio crino* Fabricius, 1793	Papilionidae	Papilioninae	Papilionini					
90	Image 12(5)	Lime Swallowtail	*Papilio demoleus* Linnaeus, 1758	Papilionidae	Papilioninae	Papilionini					
91	Image 12(6)	Blue Mormon	*Papilio polymnestor* (Cramer, [1775])	Papilionidae	Papilioninae	Papilionini			X	X	
92		Common Emigrant	*Catopsilia pomona* (Fabricius, 1775)	Pieridae	Coliadinae	Coliadini					

	Image number	Common name	Scientific name	Family	Subfamily	Tribe	New species record				Schedule Species -WPA, 1972
							PI	EEG	NEG	AP	
93	Image 13(1)	Mottled Emigrant	*Catopsilia pyranthe* (Linnaeus, 1758)	Pieridae	Coliadinae	Coliadini					
94	Image 13(2)	Common Grass Yellow	*Eurema hecabe* (Linnaeus, 1758)	Pieridae	Coliadinae	Euremini					
95	Image 13(3)	One-spot Grass Yellow	*Eurema andersonii* (Moore, 1886)	Pieridae	Coliadinae	Euremini			X	X	
96	Image 13(4)	Three-spot Grass Yellow	*Eurema blanda* (Boisduval, 1836)	Pieridae	Coliadinae	Euremini					
97	Image 13(5)	Tree Yellow	*Gandaca harina* (Horsfield, 1829)	Pieridae	Coliadinae	*Incertae sedis*	X	X	X	X	
98		Wanderer	*Pareronia hippia* (Fabricius, 1787)	Pieridae	Pierinae	Nepheroniini					
99		Common Albatross	*Appias albina* (Boisduval, 1836)	Pieridae	Pierinae	Pierini					
100		Common Jezebel	*Delias eucharis* (Drury, 1773)	Pieridae	Pierinae	Pierini					
101		Common Gull	*Cepora nerissa* (Fabricius, 1775)	Pieridae	Pierinae	Pierini					
102	Image 13(6)	Double-banded Judy	*Abisara bifasciata* Moore, 1877	Riodinidae	Nemeobiinae	Abisarini					

***Gandaca harina* (Horsfield, [1829]) (Tree Yellow)** (Image 13(4))

Our observation of *Gandaca harina* on 18 July 2015 from a shade coffee plantation edge close to Maredumilli, is the first report of this species from peninsular India.

Apart from this record, we observed this species only twice and believe that it might be rarely distributed in the northern Eastern Ghats within its preferred habitat of forest with dense forest canopy. The sub-species, *G. h. assamica* Moore, 1906, so far known to be occurring across the northeast and West Bengal (Varshney & Smetacek 2015) was recently reported from Kumaon by Sondhi (2017). Two other sub-species *G. h. andamana* Moore, 1906 and *G. h. nicobarica* Evans, 1932 has been reported from the Andaman and Nicobar Islands respectively.

DISCUSSION

A rapid and opportunistic but intensive survey of butterflies at a few sites within the northern Eastern Ghats resulted in recording 102 species of butterflies out of which 17 records were highly significant in nature. These included three new species records for peninsular India, nine new species records for the Eastern Ghats and 14 new species records for the northern Eastern Ghats. Nine of the species are accorded highest protection under the Indian Wildlife Act (Anonymous 1972) which include species such as the Orange-tailed Awl *Bibasis sena*, a new species for the Eastern Ghats and Great Jay *Graphium eurypylus*, a new species record for the Indian peninsular region. We add 17 new butterflies to the existing butterflies of the state of Andhra Pradesh.

Highest number of new species records (six) were obtained for members of the Herperiidae family, probably because most butterfly survey tends to take place once the day gets warmer, usually late morning, once the sun is fully out. Most of the Hesperiidae are shade loving and are usually crepuscular, i.e., they are most active during the early morning and evenings. Moreover, they are also fast moving and cryptic, therefore difficult to observe and capture images.

Among the other more camera-friendly and relatively more ubiquitous butterfly families, most new records were for species which are difficult to identify without handling them. Such as the Double-banded Crow *Euploea sylvester*. A few are impossible to identify conclusively without high quality images which manages to capture finer identifying morphological characteristics and wing-markings. For example, the Rounded Six-lineblue *Nacaduba berenice*, the Pallas' Sailer *Neptis sappho* and Great Jay *Graphium eurypylus*.

Thus, while the number of new records underlines how under explored the region has been till date, the high turnover of butterfly species within a short rapid survey underscores the importance of the northern Eastern Ghats as an area with significant butterfly diversity. During our survey, we recorded very high butterfly activity along the streams and roads with hundreds of lycaenids, pierids and papilionids seen to be mud puddling.

Numerous records of both Western Ghats, northeastern Indian and Himalayan butterfly species during our survey strengthens the theory that the Eastern Ghats is a transitional zone which facilitates species mixing and might have been crucial in the colonisation of peninsular India by the oriental fauna, which is known to comprise 78% of all butterflies known so far from the Western Ghats (Kunte 2016).

The Eastern Ghats, particularly the northern Eastern Ghats, is under severe developmental pressure today. Large areas, some of which include the sites we surveyed has been earmarked for many upcoming development and mining projects, including the Polavaram hydroelectric project, which will lead to the creation of one of the largest dams in India. The resulting reservoir is poised to submerge a substantial area comprised of primary forests. We feel that development at such high ecological costs has been allowed in the northern Eastern Ghats without much resistance, unlike other 'biodiversity hotspots', mainly because it has not received due attention from the conservation community.

The area is a goldmine for both the amateur natural historians and the conservation biologists seeking new avenues and area to study and conduct research. Higher engagement with this very poorly explored region will help to highlight its precarious status. For example, besides Polavaram, five other medium irrigation dams at Bhupathipalem, Musurumilli, Kovvadakalva, Jalleru and Surampalem have come up around PNP. Mining activities, particularly for bauxite in the mineral laden hilltops in Araku is a constant threat to these Ghats (Pattanaik et al. 2009a; Kumar et al. 2010; Samata 2003). Apart from such large scale threats, continuous use, extraction and disturbances of seemingly low intensities such as unruly and irresponsible tourism, high-demand for bamboo chicken, shifting cultivation, hunting and commercial plantations have been rendering many of these forest patches 'empty' by producing long term insidious impacts on the flora and fauna (Ganesh et al. 2015).

The high butterfly diversity recorded in the northern Eastern Ghats can be used to mobilise conservation attention to the ongoing damage to natural ecosystems. All the sites with high butterfly activity were very close to Maredumilli and can be easily accessed by foot. With an already existing range of accommodation options for tourists within the forest department campus, PNP has the potential to emerge as a popular butterfly tourism site, which can provide a much-needed profile boost to the region. Ecotourism is known to benefit conservation activities by enabling frequent monitoring of biodiversity and increasing the popularity of biodiversity rich area. Further, the eco-tourist tends to articulate strong and influential pro-conservation opinion during flashpoints of crises and threats. Therefore, we strongly recommend the development and implementation of a well-regulated butterfly tourism plan, within the framework of responsible and low-impact ecotourism, to attract amateur naturalists and nature lovers.

CONCLUSION

The survey showed that both the northern Eastern Ghats and the PNP are very important sites for butterfly diversity and conservation. Currently both face high conservation threats and the findings may be used to contain or reduce the extent of threat. The current findings although limited by time and funds, lay the foundation for more long-term, detailed and focussed butterfly surveys in the future. Diversity studies such as these will help to prioritise area for conservation and research, and designate no go areas for developmental and high intensity extraction/habitat transformation activities.

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